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January 23, 2006

MAIL STOP APPEAL BRIEF - PATENTS
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Re:	Inventors:	Bijendra N. Jain and Keith McCloghrie
	Assignee:	Cisco Technology, Inc.
	Title:	APPARATUS FOR ESTIMATING DELAY AND JITTER BETWEEN NETWORK ROUTERS
	Application No.:	09/583,177
	Examiner:	Christian A. LaForgia
	Filed:	May 30, 2000
	Group Art Unit:	2131
	Attorney Docket No.:	CIS0043US

Dear Sir:

Transmitted herewith are the following documents in the above-identified application:

(1) Return Receipt Postcard
(2) This Transmittal Letter (1 page, in duplicate)
(3) Appeal Brief (37 pages)

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Respectfully submitted,

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventors:	Bijendra N. Jain and Keith McCloghrie		
Assignee:	Cisco Technology, Inc.		
Title:	APPARATUS FOR ESTIMATING DELAY AND JITTER BETWEEN NETWORK ROUTERS		
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Austin, Texas
January 23, 2006

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APPEAL BRIEF

Dear Sir:

This brief is submitted in support of the Notice of Appeal filed on November 22, 2005, by Appellant to the Board of Patent Appeals and Interferences from the Examiner's final rejection of Claims 27-30, 32-36, 38-43, 45-49 and 51-59. This brief is timely submitted within the two-month period after the filing of the Notice of Appeal, which ends on January 23, 2006 (since January 22, 2006 was a Sunday).

Please charge deposit account No. 502306 for the fee of $500.00 associated with this appeal brief. Please charge this deposit account for any additional sums which may be required to be paid as part of this appeal.

REAL PARTY IN INTEREST

The real party in interest on this appeal is the Assignee, Cisco Technology, Inc.

RELATED APPEALS AND INTERFERENCES

There are no appeals or interferences related to this application.

STATUS OF CLAIMS

Claims 27-30, 32-36, 38-43, 45-49 and 51-59 are pending in the application.

Claims 1-26, 31, 37, 44, and 50 have been canceled.

Claims 27-30, 32-36, 38-43, 45-49 and 51-59 are under rejection.

Appellant appeals the rejections of claims 27-30, 32-36, 38-43, 45-49 and 51-59.

STATUS OF AMENDMENTS

No amendments were filed subsequent to the final rejection of May 31, 2005.

SUMMARY OF THE CLAIMED SUBJECT MATTER

Independent claim 27 is directed to a computer system. The computer system includes a processor, a network interface coupled to the processor and to a network, a computer readable medium coupled to the processor, and computer code that is encoded in the computer readable medium. The network includes a plurality of network elements. Each one of the network elements is coupled to at least one other of the network elements by at least one of a plurality of links. *See, for example,* Specification at pp. 1, 12, 13.

The computer code is configured to cause the processor to perform several activities. The computer code is configured to cause the processor to identify pairs of the

network elements as being in a first set of network element pairs. *See, for example, id.* at p. 18 (introducing a requirements set Φ that has P number of pairs of routers). From this first set of network element pairs, the computer code is configured to cause the processor to generate a first matrix. *See, for example, id.* at p. 20 (introducing a matrix F and its relationship to the pairs of routers in the requirements set Φ).

Each row in the first matrix corresponds to a corresponding network element pair in the first set of network element pairs. *See, for example, id.* at pp. 19, 20 (where the k'th row of the F matrix corresponds to the delay z_k between a pair of routers $\pi_k = R_i$ and R_j in the requirements set Φ). These rows in the first matrix include independent rows and non-independent rows. *See, for example, id.* at p. 20.

The computer code is also configured to cause the processor to form a second set of network element pairs. *See, for example, id.* at pp. 18, 20-23 (introducing a measurement set Ω that is a subset of Φ). The second set of network element pairs contains independent network element pairs from among the first set of network element pairs. *See, for example, id.* at p. 23. Each one of the independent pairs of network element corresponds to one of the independent rows of the first matrix. *See, for example, id.* at p. 23 ("the minimal subset of pairs of routers, Ω, between which delay must be measured is given by the collection of all pairs of routers, (R_p, R_q), that correspond to the maximal set of independent rows of F").

The computer code is also configured to cause the processor to measure a measured network performance metric. *See, for example, id.* at p. 36, lines 21-27 (measuring average round trip delay y_k and delay-jitter γ_k). The measured network performance metric is measured between two network elements for each network element pair in the second set of network element pairs. *See, for example, id.* (this measurement is performed on the router pairs in Ω, which are indicated by the index values k=1, 2, . . ., Q).

The computer code is also configured to cause the processor to compute a computed network performance metric. *See, for example, id.* at p. 36, lines 34-36 and 44-45 (calculating delay vectors Δ_k and delay-jitter σ_k). The computed network performance

metric is computed between two network elements of a remaining network element pair. The remaining network element pair is in the first set of network element pairs, and corresponds to a non-independent row of the first matrix. *See, for example, id.* (this calculation is performed for router pairs that are in Φ but are not in Ω, which are indicated by the index values k=Q+1, Q+2, . . ., P).

The computed network performance metric is computed using at least one of the measured network performance metrics. *See, for example, id.* (this calculation uses the measured values of average round trip delay y_k and delay-jitter γ_k).

Claims 28-30, 32-36, and 38-39 depend on claim 27.

Independent claim 40 is directed to a computer program product encoded in computer readable media. The computer program product comprises instructions executable on a computer system, including the sets of instructions described below. The computer system is coupled to a network that comprises a plurality of network elements. Each one of the network elements is coupled to at least one other of the network elements by at least one of a plurality of links. *See, for example, id.* at pp. 1, 12, 13.

A first set of instructions is configured to identify pairs of the network elements as being in a first set of network element pairs. *See, for example, id.* at p. 18.

A second set of instructions is configured to generate a first matrix from the first set of network element pairs. *See, for example, id.* at p. 20. The first matrix comprises independent rows and non-independent rows. *See, for example, id.* Each row in the first matrix corresponds to a corresponding network element pair in the first set of network element pairs. *See, for example, id.* at pp. 19, 20

A third set of instructions is configured to form a second set of network element pairs. *See, for example, id.* at pp. 18, 20-23. The second set of network element pairs contains independent network element pairs from among the first set of network element pairs. *See, for example, id.* at p. 23. Each one of the independent pairs of network element corresponds to a one of the independent rows of the first matrix. *See, for example, id.*

A fourth set of instructions is configured to measure a measured network performance metric. *See, for example, id.* at p. 36, lines 21-27. The measured network performance metric is measured between a first network element and a second network element of each network element pair in the second set of network element pairs. *See, for example, id.*

A fifth set of instructions is configured to compute a computed network performance metric. *See, for example, id.* at p. 36, lines 34-36 and 44-45. The computed network performance metric is computed between a first network element and a second network element of a remaining network element pair in the first set of network element pairs. The remaining network element pair corresponds to a non-independent row of the first matrix. *See, for example, id.* The computed network performance metric is computed using at least one of the measured network performance metrics. *See, for example, id.*

Claims 41-43, 45-49, and 51-52 depend on claim 40.

Independent claim 53 is directed to a computer system. This system includes a network interface that is coupled to a processor and to a network. The network includes a plurality of network elements. Each one of the network elements is coupled to at least one other of the network elements by at least one of a plurality of links. *See, for example, id.* at pp. 1, 12, 13.

This system includes means for identifying pairs of the network elements as being in a first set of network element pairs. *See, for example, id.* at p. 18.

The system includes means for generating a first matrix from the first set of network element pairs. *See, for example, id.* at p. 20. The first matrix comprises independent rows and non-independent rows. *See, for example, id.* Each row in the first matrix corresponds to a corresponding network element pair in the first set of network element pairs. *See, for example, id.* at pp. 19, 20.

The system includes means for forming a second set of network element pairs. *See, for example, id.* at pp. 18, 20-23. The second set of network element pairs contains

independent network element pairs from among the first set of network element pairs. *See, for example, id.* at p. 23. Each one of the independent pairs of network element corresponds to a one of the independent rows of the first matrix. *See, for example, id.*

The system includes means for measuring a measured network performance metric. *See, for example, id.* at p. 36, lines 21-27. The measured network performance metric is measured between a first network element and a second network element of each network element pair in the second set of network element pairs. *See, for example, id.*

The system includes means for computing a computed network performance metric. *See, for example, id.* at p. 36, lines 34-36 and 44-45. The computed network performance metric is computed between a first network element and a second network element of a remaining network element pair in the first set of network element pairs. The remaining network element pair corresponds to a non-independent row of the first matrix. *See, for example, id.* The computed network performance metric is computed using at least one of the measured network performance metrics. *See, for example, id.*

Claims 54-59 depend on claim 53.

GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Claims 27-30, 32-36, 38-43, 45-49, and 51-59 stand rejected under 35 U.S.C. § 103(a), as being unpatentable over U.S. Patent No. 6,195,553 to Claffery et al. ("*Claffery*"), in view of U.S. Patent No. 5,596,719 to Ramakrishnan et al. ("*Ramakrishnan*"), and further in view of U.S. Patent No. 6,058,103 to Henderson et al. ("*Henderson*"), in view of U.S. Patent No. 6,212,171 to LaFollette et al. ("*LaFollette*"), as indicated in the Final Office Action dated May 31, 2005 ("the Office Action"), and in the Advisory Action dated November 14, 2005 ("the Advisory Action").

THE CLAIMS ARE PATENTABLE UNDER 35 U.S.C. § 103(a)

Claims 27-30, 32-36, 38-43, 45-49, and 51-59 stand rejected under 35 U.S.C. § 103(a), as being unpatentable over *Claffery* in view of *Ramakrishnan*, and further in view of *Henderson*, in view of *LaFollette*. Appellant respectfully submits that the claims are allowable, and that Office Action fails to state a *prima facie* case of obviousness under § 103(a).

> To establish a prima facie case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations.

MPEP § 2143. Further, "The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in applicant's disclosure." *Id.* "The mere fact that references *can* be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination." MPEP § 2143.01 (emphasis in original).

The Cited References Lack a Suggestion or Motivation to Make the Modifications or Combinations Proposed in the Office Action.

Appellant respectfully submits that the Office Action fails to state a *prima facie* case of obviousness under § 103(a) for several reasons. First, the cited art does not provide a required suggestion or motivation for the desirability of the proposed combination or modification of references.

The rejections of the independent claims 27, 40, and 53 are based on a combination of four separate references: *Claffery*, *Ramakrishnan*, *Henderson*, and *LaFollette*. These four references pertain to four somewhat disparate technologies. *Claffery* relates to communications networks, particularly chains of ground stations and satellite constellations and other networks in which the availability of links is in a constant state of change. *Claffery* at col. 1, lines 1-18. *Ramakrishnan* relates to routing

in data networks that use centralized assignments of link metrics. *Ramakrishnan* at col. 1, lines 9-14. *Henderson* relates to telecommunications networks, and particularly to techniques for managing networks with diverse network elements conforming to a variety of telecommunications protocols. *Henderson* at col. 1, lines 8-12. *LaFollette* relates to serial interface bus technology, such as IEEE 1394 interfaces, and the analysis of gap counts on a serial bus. *LaFollette* at col. 1, lines 6-30.

As noted in the Office Action, various limitations of claim 27 are not disclosed in *Claffery*. Office Action at p. 4, para. 11. The Office action proposes that a combination of *Claffery* with *Ramakrishnan*, *Henderson*, and *LaFollette* discloses all the limitations of claim 27. *Id.* at pp. 4-5. The Office Action does not, however, provide adequate motivations or suggestions for combining *Claffery* with (a) *Ramakrishnan*, or with (b) *Henderson*, or with (c) *LaFollette* to support the pending rejection. The Advisory Action states that "[i]n this case, the references themselves provide some teaching, suggestion, and motivation to combine the reference." Advisory Action at p. 2.

Appellant respectfully disagrees. "The initial burden is on the examiner to provide some suggestion of the desirability of doing what the inventor has done." MPEP at § 706.02(j). The Office Action does not meet this burden.

(a) The combination of *Ramakrishnan* with *Claffery* Is Based on an Improper Application of *Smith v. Hayashi.*

The Office Action observes that *Claffery* fails to disclose the limitation from claim 27 of computer code configured to cause a processor to identify pairs of network elements as being in a first set of network element pairs. Office Action at p. 4, para. 11. The Office Action proposes, however, that in view of *Ramakrishnan*, it would have been obvious to one of ordinary skill in the art at the time the invention was made to identify pairs of network elements as being in a first set of network element pairs because this activity involves a substitution of equivalents known for the same purpose. Office Action at p. 4, paras. 12-13. In support of this argument, the Office Action cites MPEP § 2144.06 and *Smith v. Hayashi*, 209 U.S.P.Q. 754 (Bd. of Pat. Inter. 1980).

The rule in *Smith v. Hayashi*, however, does not apply in this case. This rule relates to the substitution of equivalents known for the same purpose. Such substitutions are discussed in MPEP § 2144.06 with regard to situations in which (i) an invention matches the prior art except for an element that has been substituted, (ii) the substituted element is a known equivalent of the prior-art element, and (iii) the substituted element was known for the same purpose as the prior-art element.

In *Smith*, two elements functioned as equivalent photoconductors in the claimed environment. *Smith* stands for the understanding that the mere fact that elements functioned as equivalents is not sufficient to establish that one would have been obvious over the other. Rather, further evidence is needed to show that the equivalents were known to be used for the same purpose. In *Smith*, additional facts showing that both photoconductors were known in the art of electrophotography presented strong evidence of obviousness. MPEP § 2144.06.

Even assuming the Office Action's characterization of the cited references *Ramakrishnan* and *Claffery* is correct (and Appellant does not concede this point), the Office Action does not set forth how claim 27 involves a substitution of equivalents. The Office Action does not reach the standard of analysis set forth in *Smith*, because the Office Action fails to indicate an aspect of *Claffery* for which a substitute may be found in *Ramakrishnan*.

The Office Action observes that *Claffery* fails to disclose the limitation from claim 27 of computer code configured to cause a processor to identify pairs of network elements as being in a first set of network element pairs. Office Action at p. 4, para. 11. The Office Action then proposes that "identifying pairs of network elements" and "identifying links" are both known and used in the art for determining the shortest path through a network. However, the Office Action does not identify an element of *Claffery* that corresponds to the missing limitation. Additionally, Appellant sees no such corresponding element in *Claffery*.

The Office Action then proposes that the missing limitation is present in *Ramakrishnan*, and proposes that these two references may be combined under the doctrine of substituting equivalents known for the same purpose. However, since

Claffery does not present an aspect that corresponds to the missing limitation, there is nothing in *Claffery* that may be successfully substituted by the teachings of *Ramakrishnan*.

Thus, the discussion in the Office Action does not appear to describe a substitution. Rather, the Office Action proposes that *Ramakrishnan* may be used to make an addition to *Claffery*. In this situation, *Smith* does not apply, because *Smith* is relevant only in situations where an invention matches the prior art except for an element that has been *substituted*, and is not relevant where an element needs to be *added* to a prior art reference to achieve the claimed invention.

The Office Action's use of *Smith* and the doctrine of substituting equivalents known for the same purpose are therefore inapposite for this case. Further, the Office Action does not set forth any other rationale for the proposed combination of *Ramakrishnan* and *Claffery*. Accordingly, the Office Action fails to set forth a suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to make the proposed combination of these references.

Further, Appellant also finds no aspect of *Claffery* (or other cited references) that would be substituted by the cited features of *Ramakrishnan* to meet the limitation of computer code configured to cause a processor to "identify pairs of said network elements as being in a first set of network element pairs."

Appellant therefore respectfully submits that identifying pairs of network elements as set forth in claim 27 is not a substitution of a known equivalent, and would not have been obvious to one of ordinary skill in the art at the time the invention was made. For this reason, claim 27 and all claims that depend therefrom are patentable under § 103(a). At least for similar reasons, independent claims 40 and 53 and all claims that depend therefrom are also patentable under § 103(a).

(b) The Office Action Fails to Present a Suggestion or Motivation Found in the Prior Art for the Combination of *Henderson* with *Claffery*.

The Office Action observes that *Claffery* fails to disclose the limitation from claim 27 of computer code configured to cause a processor to generate a first matrix that includes independent rows and non-independent rows. Office Action at p. 4, para. 11. The Office Action proposes, however, that it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify *Claffery* with the teachings of *Henderson* with the proposed motivation for the modification being to "aid in measuring performance metrics between adjacent nodes and computing performance metrics for nodes that have an intervening node." The Office Action states that this motivation may be found "in Claffery in column 18." Office Action at p. 5, para. 15.

As an initial matter, Appellant notes that this statement from the Office Action appears to be in error. The *Claffery* reference ends in column 12; *Claffery* does not have a "column 18." Additionally, none of the material in *Claffery* discusses the measurement of performance metrics. Thus, the stated motivation for combining references is not actually present in *Claffery*. Appellant respectfully submits that the Office Action therefore does not set forth a motivation for the proposed combination of *Henderson* with *Claffery*.

Nonetheless, in an attempt to apply the reasoning set forth in the Office Action, Appellant has also reviewed *Henderson* to search for the proposed motivation of combining *Henderson* and *Claffery*. As described below, *Henderson* also fails to present the motivation asserted in the Office Action.

Appellant notes that columns 16-19 of *Henderson* discuss the calculation and measurement of performance metrics. This reference describes a "Q-metric" that aids in performing design functions.

> Moreover, the present invention calculates metrics to aid in performing the design functions. As described below, a Q-metric is cumulative quality metric that indicates the quality of communication for a given path in a network. The Q-metric depends on the physical characteristics of equipments in the path.

> Although described below in the context of network synchronization management, it would be apparent to those skilled in the art that the management functions and performance metrics are applicable to management of a telecommunications network in general. For example, diversity considerations can be used in any network requiring alternate destination paths to improve the robustness of the network's ability to restore itself. Likewise, the Q-metric can be used to calculate a particular path's communications quality in any network model. In the context of network synchronization management, a communication signal is a synchronization signal or timing signal.

Henderson at col. 16, lines 45-62. Further information on the Q-metric is set forth in column 18 of *Henderson*.

> A Q-metric is a measure of the quality of a particular path for distributing timing to a particular site. More specifically the Q-metric is a measure of the cumulative phase disruption of intervening network elements in a synchronization path. Without such a metric, a network engineer is left with little more than a guess as to which synchronization path is most probably the best. In the preferred embodiment of the present invention, the Q-metric is modeled as:
>
> $$Q = (q(miles) + q(LRE) + q(Line\ Timed\ Device)) * q(line),$$
>
> where:
>
> Q is the Q-metric metric,
>
> q(miles) is an empirically determined value corresponding to the degradation of synchronization per mile of optical fiber,
>
> q(LRE) is an empirically determined value corresponding to degradation caused by regeneration elements along a synchronization path.
>
> q(Line Timed Device) is a value corresponding to the accuracy of a timing source, e.g. a timing signal generator, and
>
> q(line) is an equipment "slack" factor that can be used to account for equipment and manufacturer degradations, e.g., optical aging.
>
> The Q-metric can be derived for any synchronization path in a telecommunication network. A network engineer can use the Q-metric to determine the best path from among several alternatives. Thus, use of the Q-metric prevents the often trial-and-error method of conventional synchronization distribution methods.

> The Q-metric has 2 additional uses. The first use is to predict the performance of a particular path in the network. The second use is to compare the predicted performance with actual performance to identify potential problems where failures are likely to occur in the network.
>
> The Q-metric as defined above can be customized. That is, a customer can adjust the various parameters of the Q-metric to account for other network phenomena. For example, the customer can adjust the Q-metric parameters to account for synchronization topology, rather than line, effects.

Henderson at col. 18, line 38—col. 19, line 12.

The Q-metric is in apposition with another factor described in *Henderson*: diversity considerations. The diversity analysis in *Henderson* chooses paths so as to minimize the number of common network elements between them. *Id.* at col. 18, lines 31-37.

> Diversity considerations have higher priority than Q-metrics. That is, a path having a high Q-metric, but having an unfavorable diversity analysis is not chosen over a path having a lower Q-metric but a favorable diversity analysis. The reason is that diversity is a measure of a telecommunications network's ability to repair itself in the event of a failure or degradation, whereas the Q-metric predicts performance degradation.

Id. at col. 19, lines 13-20.

These discussions in *Henderson* of Q-metrics and of diversity do not, however, set forth information on the measurement of performance metrics between adjacent nodes. They also do not relate to the computing of performance metrics for nodes or links that have an intervening node. Thus, these discussions do not present a motivation, as proposed in the Office Action, to "aid in measuring performance metrics between adjacent nodes" or to aid in "computing performance metrics for nodes that have an intervening node." This motivation is therefore not present in *Henderson*.

As described above, this motivation is also not present in *Claffery*, in contrast with the Office Action's assertion. Further, Appellant also does not find this motivation in any of the other cited references. Accordingly, the Office Action fails to set forth a suggestion or motivation, either in the references themselves or in the knowledge

generally available to one of ordinary skill in the art, to make the proposed combination of *Henderson* and *Claffery*.

Appellant therefore respectfully submits that for this reason as well, claim 27 and all claims that depend therefrom are patentable under § 103(a). At least for similar reasons, independent claims 40 and 53 and all claims that depend therefrom are also patentable under § 103(a).

(c) The Office Action Fails to Present a Suggestion or Motivation Found in the Prior Art for the Combination of *Henderson* with *LaFollette.*

With respect to *LaFollette*, the Office Action notes that *Claffery* does not disclose computer code configured to cause a processor to measure a measured network performance metric between a first network element and a second network element of each network element pair in a second set of network element pairs, as set forth in claim 27. Office Action at p. 4, para. 11. The Office Action proposes, however, that such techniques are disclosed in *LaFollette*, and suggests that it would have been obvious to modify *Claffery* accordingly, "since LaFollette states at column 6, lines 26-40 that such a modification would provide an accurate measure since the measure node is not on the path that connects the network element pairs." Office Action at p. 5, paras. 16, 17. Appellant respectfully disagrees.

Appellant respectfully submits that even assuming the Office Action's characterization of *LaFollette* and *Claffery* is correct (and Appellant does not concede this point), this observation does not provide a reason to combine these references. At most, the Office Action points out a goal in *LaFollette* that is fully realized in *LaFollette* itself. Accordingly, a person having ordinary skill in the art would not look beyond *LaFollette* to achieve this goal, and would certainly not turn to *Claffery* with this goal in mind.

LaFollette relates to bus interfaces in general and, in particular, to a method and apparatus for determining a gap count for a serial bus. *LaFollette* at col. 1, lines 6-8. The cited portion of *LaFollette* follows.

> As shown in FIG. 3 and described above, the measuring node determines a round-trip delay for each pair of leaf nodes in a network at step 302. The technique used to determine the round-trip delay, however, varies according to where the measuring node is located with respect to the leaf nodes. The possible topologies resolve into three categories:
>
> 1. The measuring node is a leaf and the round-trip delay is to be measured to another leaf;
>
> 2. The measuring node is not a leaf but is on the path that connects two leaves whose round-trip delay is to be measured; and
>
> 3. The measuring node is neither a leaf nor on the path that connects two leaves whose round-trip delay is to be measured.
>
> With respect to topology 1, assume that nodes B, C and D are not present, that is, node M and node A are leaf nodes.

LaFollette at col. 6, lines 26-41.

First, a person having ordinary skill in the art would not modify *Claffery* with the motivation proposed in the Office Action, since that proposed motivation is not actually present in *LaFollette*. In particular, the cited passage (quoted above) does not in fact indicate that using the teachings of *LaFollette* "would provide an accurate measure."

Second, this passage from *LaFollette* does not provide a motivation that would prompt a reader to seek the teachings of *Claffery*. Rather, the cited passage notes a challenge that is addressed and resolved to completion in *LaFollette* itself. The three situations presented in the above list are addressed the subsequent text of *LaFollette* and in FIGS. 4 and 5 of that reference. *Id.* at col. 6, lines 40-45.

Appellant also sees no other aspects of *LaFollette* that would provide a motivation to a person skilled in the art to combine this reference with *Claffery*. Accordingly, the Office Action fails to set forth a suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to make the proposed combination of *LaFollette* and *Claffery*.

Appellant therefore respectfully submits that for this reason as well, claim 27 and all claims that depend therefrom are patentable under § 103(a). At least for similar

reasons, independent claims 40 and 53 and all claims that depend therefrom are also patentable under § 103(a).

Even if the Cited References Were Combined, the Result Would Not Provide Appellant's Invention.

Even if the proposed combination of references were proper, the Office Action would still fail to state a *prima facie* case of obviousness under § 103(a) because the resulting combination would not successfully achieve the Appellant's invention. As described below, an attempt to combine *Claffery*, *Ramakrishnan*, *Henderson*, and *LaFollette* would, at best, lead to a system that does not correspond to Appellant's claimed invention.

The proposed combination of references starts with the teachings of *Claffery*, which sets forth communications networks, particularly chains of ground stations and satellite constellations and other networks in which the availability of links is in a constant state of change. *Claffery* at col. 1, lines 1-18. *Claffery* constructs a link availability matrix that indicates start times and end times when a pair of objects (such as fixed and mobile ground stations, communications ships, and satellites) can communicate with each other. *Id.* at col. 5, lines 20—col. 6, line 9.

The second reference, *Ramakrishnan*, relates to routing in data networks that use centralized assignments of link metrics. *Ramakrishnan* at col. 1, lines 9-14. The cited portions of *Ramakrishnan* observe that various routing flows may be used to connect an origin-destination (OD) pair of nodes, *id.* at col. 1, lines 57-65, and proposes techniques for finding paths that may preferably be diverted to minimize the increase in path distances, *id.* at col. 8, lines 15-43. Arguably, this teaching may be appended to the teachings of *Claffery* to provide a system that tracks communications systems and identifies routings that may be diverted, when needed, while minimizing the resulting increases in path distances.

The third reference, *Henderson*, relates to telecommunications networks and particularly to techniques for managing networks with diverse network elements conforming to a variety of telecommunications protocols. *Henderson* at col. 1, lines 8-

12. The cited portions of *Henderson* describe various views of a network, including a topographical view (FIG. 5A), a topological view (FIG. 5B), a logical view (FIG. 5C), and a reference table (FIG. 5D). *Id.* at col. 14, lines 9-56. The logical view indicates connections (e.g., 512) in terms of physicals links (e.g., 503 and 508) from the topological view.

The teachings of *Henderson* may arguably modify the above combination of *Claffery* and *Ramakrishnan* to include connections based on a series of several underlying physical links. Appellant notes that *Henderson* does not add new teachings to *Claffery*, since *Claffery* itself observes that connections may be based on a series of several underlying physical links. For example, *Claffery* notes that a connection between ground stations in New York and Tokyo may use several satellites that form intermediate links between the ground stations. *Claffery* at col. 5, lines 49-58. The relevant teachings of *Henderson* are therefore cumulative with those of *Claffery*. For this reason as well, Appellant reiterates the argument made above, that a person having ordinary skill in the art would not have a motivation to combine *Henderson* with *Claffery*.

Finally, the fourth reference, *LaFollette*, relates to serial interface bus technology, such as IEEE 1394 interfaces, and the analysis of gap counts on a serial bus. *LaFollette* at col. 1, lines 6-30. The cited portions of *LaFollette* describe techniques for measuring average round-trip delay times and jitter among pairs of leaf nodes in a network. *Id.* at FIG. 4, blocks 402 and 406; col. 5, lines 3-17; col. 6, lines 47-67; and col. 8, lines 8-18. Arguably, this teaching may be used to measure delay times and jitter among the nodes of the system.

The resulting *Claffery-Ramakrishnan-Henderson-LaFollette* system would be a communications network in which the availability of links is monitored by a link availability matrix that indicates start times and end times when various links may be established. The system would include tools for identifying routings that may be diverted when needed, while minimizing the resulting increases in path distances. The system would also include connections based on a series of several underlying physical links. Delay times and jitter may be measured among the nodes of the system.

However, than attempt to combine these references would fall far short of successfully achieving the invention as recited in the pending claims. The teachings of these references would not present a computer system as set forth in claim 27, for example, with computer code configured to make the measurements and the computations as indicated in the claim.

In contrast, various implementations of the present invention include measurements and computations that may provide various advantages. For example, in one implementation of a computer system, data are *measured* only on a judiciously selected set of routers. The measurements set is a small subset of pairs of routers in a network. Specification at p. 12, lines 17-25; p. 30, line 26—p. 31, line 16; FIG. 3, blocks 300-345. The remaining required data do not need to be measured. Rather, the remaining data may be *calculated* based on the measured data. *Id.* at p. 31, lines 16-18; FIG. 3, block 350. This savings in the number of required measurements may provide a significant improvement over the complexity and time that would otherwise be needed to measure delays between every pair of routers in a required set of routers. *Id.* at p. 12, lines 23-28.

This feature and others that may be present in various implementations of the present invention would be absent from the proposed *Claffery-Ramakrishnan-Henderson-LaFollette* combination system. The absence of such features stems from the fact that the proposed combination system does not teach various limitations of the claimed invention (as discussed below). For example, the proposed combination system would not measure a measured network performance metric and would not compute a computed network performance metric as set forth in claim 27, with the measuring and computing performed in relation to first and second sets of network element pairs and independent rows and non-independent rows of a first matrix, as indicated by the claim limitations. In view of these shortcomings of the proposed *Claffery-Ramakrishnan-Henderson-LaFollette* combination system, the proposed combination of references would not have a reasonable expectation of successfully achieving the claimed invention.

For this reason as well, Appellant respectfully submits that claim 27 and all claims that depend therefrom are patentable under § 103(a). At least for similar reasons,

independent claims 40 and 53 and all claims that depend therefrom are also patentable under § 103(a).

The Cited Art Fails to Teach or Suggest
All the Limitations of the Claims

Moreover, Appellant respectfully submits that even if each of the proposed combinations of references were proper, the claimed invention would be patentable over the cited references under § 103(a) because the cited references, taken either separately or in combination, fail to disclose all the limitations of the claimed invention. Regarding independent claims 27, 40, and 53, various limitations are not disclosed by *Claffery*, *Ramakrishnan*, *Henderson*, or *LaFollette*, whether taken individually or in combination.

For example, claim 27 is directed to a computer system and includes a limitation of computer code configured to cause a processor to generate a first matrix. The first matrix includes **independent rows and non-independent rows**. An understanding of the independent and non-independent rows may be seen in the originally filed specification.

> Consider the row vectors, F_k, $k = 1, 2, \ldots, P$ and let Q be the maximum number of independent row vectors. As can be seen, Q is equal to the rank of matrix F (i.e., Rank(F)). Without loss of generality, F_1 F_2 … F_Q be the independent row vectors of matrix F. This is without loss of generality because the row vectors F_k in F (and similarly the corresponding pairs of routers in Φ) can be re-arranged, if necessary. Then, every row vector F_k, $k = Q+1, Q+2, \ldots, P$, can be expressed as a linear combination of row vectors, F_k, $k = 1, 2, \ldots, Q$.

Specification, at p. 20, lines 23-29.

Thus, the "independent rows" and "non-independent rows" are independent and non-independent rows in the context of linear algebra, where the non-independent rows of a matrix may be recognized as linear combinations of the independent rows.

An example of the relationship between independent and non-independent rows is also presented.

If $F_1, F_2, \ldots, F_Q$ is a maximal set of linearly independent rows of F, then row vectors $F_{Q+1}, F_{Q+2}, \ldots, F_P$ can be expressed as a linear combination of $F_1, F_2, \ldots, F_Q$. In other words, F_k can be expressed in terms of:

$$F_k = \Sigma_{i=1,\ldots,Q} (\alpha_{k,i} F_i),\ k = Q+1, Q+2, \ldots, P \qquad (15)$$

Specification, at p. 20, line 31—21, line 1.

Neither *Claffery, Ramakrishnan, Henderson*, nor *LaFollette* discuss independent rows and non-independent rows of matrices, as would be understood in the context of linear algebra. Indeed, the Appellant sees no use of the properties of independent and non-independent rows of matrices, in the context discussed above, in any of the cited references.

With regard to this limitation, the Office Action cites *Henderson*. The cited portions of *Henderson* describe various views of a network, including a topographical view (FIG. 5A), a topological view (FIG. 5B), and a logical view (FIG 5C). *Henderson* at col. 14, lines 9-56. The logical view indicates connections (e.g., 512) in terms of physicals links (e.g., 503 and 508) from the topological view.

However, the cited art does not describe independent rows and non-independent rows of matrices. The Office Action discusses elements from FIGS. 5C and 5D of *Henderson*. *Henderson's* FIGS. 5C is a graphical output that includes schematic illustrations of various connections. *Henderson's* FIGS. 5D is a reference table that summarizes information from FIG. 5C.

In the graphical output of FIG. 5C, some of the connections rely on a single physical link (such as connections 511, 513, 514, 516-519, and 522), and some of the connections include more than one physical link (such as connections 512, 515, 520, and 521).

The Office Action appears to suggest that the single-link connections illustrated in FIG. 5C and 5D of *Henderson* are "independent rows" of a matrix, and that the multiple-link connections illustrated in these figures are "dependent rows" of a matrix. Appellant respectfully disagrees.

The first error in the Office Action's understanding of *Henderson* is the proposition that either the graphical output of FIGS. 5C or the reference table of FIG. 5D is a "matrix." The captions for these figures names them as a "Logical Matrix" and a "Tabular Site Connection Matrix." Nonetheless, a person having ordinary skill in the art would not understand either the graphical output of FIG. 5C or the reference table of FIG. 5D to be a "matrix" in the context of the present application.

Pending claim 27 and the Specification set forth that the "first matrix" is a mathematical matrix. In contrast, FIGS. 5C and 5D set forth a graphical output and a reference table that do not include numerical matrix elements and which are not usable in matrix arithmetic or other matrix calculations. The graphical output in FIG. 5C is a visual display for a user, and presents textual identifiers of various network connections and associated schematic descriptions of those connections. The reference table in FIG. 5D is a summary of information presented in FIG. 5C. Neither of these figures would be understood by a person of ordinary skill in the art as disclosing the "first matrix" in pending claim 27.

The second error in the Office Action's understanding of *Henderson's* FIGS. 5C and 5D is the proposition that various sections of the graphical output constitute "independent rows" and "non-independent rows." The Office Action proposes that the schematics of single-link connections are independent rows and that the schematics of multiple-link connections are non-independent rows. This understanding does not follow from any teaching or discussion in *Henderson*. In the description of FIGS. 5C and 5D, *Henderson* does not describe these various schematics as being independent or non-independent. At most, it may be argued that some of the schematics depict connections that depend on more than one physical link, while others depend only on a single physical link. Appellant submits that nothing in *Henderson's* FIG. 5C or 5D or the associated discussion indicates that any of the schematics in that figure should be understood as "independent" or "non-independent." These attributes are not suggested, described, or taught in *Henderson*.

Further, *Henderson* does not describe the various schematics as being "independent rows" or "non-independent rows." Appellant sees no relationship among

the various rows in *Henderson's* FIG. 5C and 5D that would make them independent or non-independent of each other. For example, *Henderson* does not teach that the single-link connections 511, 513, 514, 516-519, and 522 (cited in the Office Action as being independent rows) are in any way independent of the multiple-link connections 512, 515, 520, and 521 (cited in the Office Action as being non-independent rows).

Accordingly, *Henderson* does not disclose the limitation of a first matrix with independent rows and non-independent rows. For this reason as well, Appellant respectfully submits that claim 27 and all claims that depend therefrom are patentable under § 103(a). At least for similar reasons, independent claims 40 and 53 and all claims that depend therefrom are also patentable under § 103(a).

As a second example of a limitation that is absent from the cited art, the computer code in claim 27 is also configured to cause the processor to form a second set of network element pairs. This second set of network element pairs contains independent network element pairs. **Each of the independent pairs of network element corresponds to one of the independent rows of the first matrix.**

The Office Action states that this limitation is disclosed in *Claffery*. Office Action at pp. 3-4, para. 10. Appellant respectfully disagrees.

The cited sections of *Claffery* present a Link Availability Matrix. The Link Availability Matrix indicates the possibility of pairing objects and the corresponding intervals of link availability. This table includes entries such as "Always," "Never," and "Time Dependent." *Claffery* at col. 8, lines 15-20. *Claffery* also presents a Cost Matrix "constructed . . . on the basis of the Link Availability Matrix. The Cost Matrix is set up in terms of link weights, such as a weight of 1 to indicate 'link available' and a weight of infinity to indicate 'link not available,' or a scale of weights assigned on the basis of cost functions such as link distance, link quality, link active/inactive etc." *Id.* at col. 8, lines 26-33.

The Link Availability Matrix and the Cost Matrix in *Claffery* do not, however, include any correspondence between independent pairs of network elements and independent rows of a matrix. These aspects of *Claffery* do not suggest, teach, or discuss the forming of a second set of network element pairs with independent network element

pairs, with each one of the independent pairs of network elements corresponding to one of the independent rows of a first matrix.

Accordingly, *Henderson* does not disclose the limitation of computer code configured to cause a processor to form a second set of network element pairs with independent network element pairs, where each one of the independent pairs of network element corresponds to a one of the independent rows of the first matrix. For this reason as well, Appellant respectfully submits that claim 27 and all claims that depend therefrom are patentable under § 103(a). At least for similar reasons, independent claims 40 and 53 and all claims that depend therefrom are also patentable under § 103(a).

As a third example of a limitation that is absent from the cited art, the computer code in claim 27 is configured to cause the processor to form **a second set of network element pairs that <u>contains</u> independent network element pairs**.

The Office Action states that this limitation is also disclosed in *Claffery*. Office Action at pp. 3-4, para. 10. Appellant respectfully disagrees.

The cited portion of *Claffery* is set forth below, and presents the above-described Cost Matrix.

> 4. For the Current Evaluation Time, a Cost Matrix is constructed 16 on the basis of the Link Availability Matrix. The Cost Matrix is set up in terms of link weights, such as a weight of 1 to indicate "link available" and a weight of infinity to indicate "link not available," or a scale of weights assigned on the basis of cost functions such as link distance, link quality, link active/inactive etc.

This passage does not teach, describe, or suggest forming or using a set of network element pairs that <u>contains</u> independent network element pairs. At most, the cited passage describes pairs of links that correspond to links in *Claffery's* Link Availability Matrix. The Link Availability Matrix does not, however, contain only references to independent network element pairs. Rather, the Link Availability Matrix casts a deliberately wide net, and contains link availability intervals "for each possible pairing of objects in the network." *Claffery* at col. 8, lines 15-17. Accordingly, the Cost Matrix is also based on each possible pairing of objects in the network. Thus, neither the

Cost Matrix nor the Link Availability Matrix is limited to references to independent network element pairs.

Accordingly, *Claffery* does not disclose a second set of network element pairs that contains independent network element pairs. For this reason as well, Appellant respectfully submits that claim 27 and all claims that depend therefrom are patentable under § 103(a). At least for similar reasons, independent claims 40 and 53 and all claims that depend therefrom are also patentable under § 103(a).

CONCLUSION

For the above reasons, Appellant respectfully submits that the rejections of pending Claims 27-30, 32-36, 38-43, 45-49 and 51-59 are unfounded. Accordingly, Appellant respectfully requests that the Board reverse the rejections of these claims.

I hereby certify that this correspondence is being deposited with the United States Postal Service as First Class Mail in an envelope addressed to: Mail Stop: Appeal Brief - Patents, Commissioner for Patents, P.O. Box 1450, Alexandria, VA, 22313-1450, on January 23, 2006

Cyrus Bharucha 2006 JAN 23

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APPENDIX OF CLAIMS

Listing of Claims

1-26. (Canceled)

27. (Previously Presented) A computer system comprising:

a processor;

a network interface, coupled to said processor and to a network, wherein said network comprises a plurality of network elements and each one of said network elements is coupled to at least one other of said network elements by at least one of a plurality of links;

a computer readable medium coupled to said processor; and

computer code, encoded in said computer readable medium, configured to cause said processor to:

identify pairs of said network elements as being in a first set of network element pairs;

generate a first matrix from said first set of network element pairs, wherein

each row in said first matrix corresponds to a corresponding network element pair in said first set of network element pairs, and

said first matrix comprises independent rows and non-independent rows;

form a second set of network element pairs, wherein

said second set of network element pairs contains independent network element pairs in said first set of network element pairs, and

each one of said independent pairs of network element corresponds to a one of said independent rows of said first matrix;

measure a measured network performance metric between a first network element and a second network element of each network element pair in said second set of network element pairs; and

compute a computed network performance metric between a first network element and a second network element of a remaining network element pair in said first set of network element pairs using at least one of said measured network performance metrics, wherein said remaining network element pair corresponds to a non-independent row of said first matrix.

28. (Original) The computer system of claim 27, wherein said first set of network element pairs is a requirements set.

29. (Original) The computer system of claim 28, wherein said second set of network element pairs is a measurements set.

30. (Original) The computer system of claim 29, wherein each one of said network elements is a router.

31. (Canceled)

32. (Original) The computer system of claim 27, wherein said computer code is further configured to cause said processor to:

compute a number, wherein said number is equal to a rank of said first matrix;

determine if a first said number of rows of said first matrix are independent; and

if said first said number of said rows of said first matrix are not independent, re-arrange said rows of said first matrix such that said first said number of said rows of said first matrix are independent.

33. (Original) The computer system of claim 32, wherein said computer code is further configured to cause said processor to:

identify a maximal set of independent rows of said first matrix based on said number.

34. (Original) The computer system of claim 32, wherein said computer code configured to cause said processor to re-arrange said rows of said first matrix such that said first said number of said rows of said first matrix are independent, if said first said number of said rows of said first matrix are not independent, is further configured to cause said processor to:

re-arrange said pairs of said network elements in said first set of network element pairs such that said correspondence between each row of said first matrix and said corresponding network element pair in said first set of network element pairs is maintained.

35. (Original) The computer system of claim 34, wherein said computer code configured to cause said processor to form said second set of network element pairs is configured to cause said processor to:

copy a first said number of pairs of said network elements in said first set of network element pairs into said second set of network element pairs.

36. (Original) The computer system of claim 27, wherein said computer code configured to cause said processor to compute said computed network performance metric between said first network element and said second network element of said remaining network element pair is configured to cause said processor to:

form a second matrix, wherein

each row of said second matrix corresponds to a corresponding one of said non-independent rows of said first matrix, and

said each row of said second matrix is such that said corresponding one of said non-independent rows of said first matrix can be expressed in terms of said independent rows using said each row of said second matrix;

organize said measured network performance metrics into a vector; and

compute said computed network performance metric between said first network element and said second network element of said remaining network element pair by multiplying said vector by a row of said second matrix corresponding to said remaining network element pair.

37. (Canceled)

38. (Original) The computer system of claim 27, wherein said computer code configured to cause said processor to compute said computed network performance metric between said first network element and said second network element of said remaining network element pair is further configured to configured to cause said processor to:

create a vector equivalent to said non-independent row of said first matrix by combining a plurality of said independent rows of said first matrix; and

compute said computed network performance metric by combining a measured network performance metric of each network element pair of said second set of network element pairs corresponding to one of said plurality of said independent rows of said first matrix.

39. (Original) The computer system of claim 27, wherein each one of said network elements is a router.

40. (Original) A computer program product encoded in computer readable media, said computer program product comprising:

a first set of instructions, executable on a computer system, configured to identify pairs of said network elements as being in a first set of network element pairs, wherein

said computer system is coupled to a network, wherein said network comprises a plurality of network elements and each one of said network elements is coupled to at least one other of said network elements by at least one of a plurality of links;

a second set of instructions, executable on said computer system, configured to generate a first matrix from said first set of network element pairs, wherein

each row in said first matrix corresponds to a corresponding network element pair in said first set of network element pairs, and

said first matrix comprises independent rows and non-independent rows;

a third set of instructions, executable on said computer system, configured to form a second set of network element pairs, wherein

said second set of network element pairs contains independent network element pairs in said first set of network element pairs, and

each one of said independent pairs of network element corresponds to a one of said independent rows of said first matrix;

a fourth set of instructions, executable on said computer system, configured to measure a measured network performance metric between a first network element and a second network element of each network element pair in said second set of network element pairs; and

a fifth set of instructions, executable on said computer system, configured to compute a computed network performance metric between a first network element and a second network element of a remaining network element pair in said first set of network element pairs using at least one of said measured network performance metrics, wherein said remaining network element pair corresponds to a non-independent row of said first matrix.

41. (Original) The computer program product of claim 40, wherein said first set of network element pairs is a requirements set.

42. (Original) The computer program product of claim 41, wherein said second set of network element pairs is a measurements set.

43. (Original) The computer program product of claim 42, wherein each one of said network elements is a router.

44. (Canceled)

45. (Previously Presented) The computer program product of claim 40, further comprising:

a sixth set of instructions, executable on said computer system, configured to compute a number, wherein said number is equal to a rank of said first matrix;

a seventh set of instructions, executable on said computer system, configured to determine if a first said number of rows of said first matrix are independent; and

an eighth set of instructions, executable on said computer system, configured to re-arrange said rows of said first matrix such that said first said number of said rows of said first matrix are independent, if said first said number of said rows of said first matrix are not independent.

46. (Original) The computer program product of claim 45, further comprising:

a ninth set of instructions, executable on said computer system, configured to identify a maximal set of independent rows of said first matrix based on said number.

47. (Original) The computer program product of claim 45, wherein said eighth set of instructions comprises:

a first sub-set of instructions, executable on said computer system, configured to re-arrange said pairs of said network elements in said first set of network element pairs such that said correspondence between each row of said first matrix and said corresponding network element pair in said first set of network element pairs is maintained.

48. (Original) The computer program product of claim 47, wherein said third set of instructions comprises:

a second sub-set of instructions, executable on said computer system, configured to copy a first said number of pairs of said network elements in said first set of network element pairs into said second set of network element pairs.

49. (Original) The computer program product of claim 40, wherein said fifth set of instructions comprises:

a first sub-set of instructions, executable on said computer system, configured to form a second matrix, wherein

each row of said second matrix corresponds to a corresponding one of said non-independent rows of said first matrix, and

said each row of said second matrix is such that said corresponding one of said non-independent rows of said first matrix can be expressed in terms of said independent rows using said each row of said second matrix;

a second sub-set of instructions, executable on said computer system, configured to organize said measured network performance metrics into a vector; and

an third sub-set of instructions, executable on said computer system, configured to compute said computed network performance metric between said first network element and said second network element of said remaining network element pair by multiplying said vector by a row of said second matrix corresponding to said remaining network element pair.

50. (Canceled)

51. (Original) The computer program product of claim 40, wherein said fifth set of instructions comprises:

a first sub-set of instructions, executable on said computer system, configured to create a vector equivalent to said non-independent row of said first matrix by combining a plurality of said independent rows of said first matrix; and

a second-subset of instructions, executable on said computer system, configured to compute said computed network performance metric by combining a measured network performance metric of each network element pair of said second set of network element pairs corresponding to one of said plurality of said independent rows of said first matrix.

52. (Original) The computer program product of claim 40, wherein each one of said network elements is a router.

53. (Previously Presented) A computer system comprising:

a network interface, coupled to a processor and to a network, wherein said network comprises a plurality of network elements and each one of said network elements is coupled to at least one other of said network elements by at least one of a plurality of links;

means for identifying pairs of said network elements as being in a first set of network element pairs;

means for generating a first matrix from said first set of network element pairs, wherein

each row in said first matrix corresponds to a corresponding network element pair in said first set of network element pairs, and

said first matrix comprises independent rows and non-independent rows;

means for forming a second set of network element pairs, wherein

said second set of network element pairs contains independent network element pairs in said first set of network element pairs, and

each one of said independent pairs of network element corresponds to a one of said independent rows of said first matrix;

means for measuring a measured network performance metric between a first network element and a second network element of each network element pair in said second set of network element pairs; and

means for computing a computed network performance metric between a first network element and a second network element of a remaining network element pair in said first set of network element pairs using at least one of said measured network performance metrics, wherein said remaining network element pair corresponds to a non-independent row of said first matrix.

54. (Original) The computer system of claim 53, further comprising:

compute a number, wherein said number is equal to a rank of said first matrix;

means for determining if a first said number of rows of said first matrix are independent; and

means for re-arranging said rows of said first matrix such that said first said number of said rows of said first matrix are independent, if said first said number of said rows of said first matrix are not independent.

55. (Original) The computer system of claim 54, wherein said computer code is further configured to cause said processor to:

means for identifying a maximal set of independent rows of said first matrix based on said number.

56. (Original) The computer system of claim 54, wherein said means for re-arranging said rows of said first matrix such that said first said number of said rows of said first matrix are independent, if said first said number of said rows of said first matrix are not independent, further comprises:

means for re-arranging said pairs of said network elements in said first set of network element pairs such that said correspondence between each row of

said first matrix and said corresponding network element pair in said first set of network element pairs is maintained.

57. (Original) The computer system of claim 56, wherein said means for forming said second set of network element pairs further comprises:

means for copying a first said number of pairs of said network elements in said first set of network element pairs into said second set of network element pairs.

58. (Original) The computer system of claim 53, wherein said means for computing said computed network performance metric between said first network element and said second network element of said remaining network element pair further comprises:

means for forming a second matrix, wherein

each row of said second matrix corresponds to a corresponding one of said non-independent rows of said first matrix, and

said each row of said second matrix is such that said corresponding one of said non-independent rows of said first matrix can be expressed in terms of said independent rows using said each row of said second matrix;

means for organizing said measured network performance metrics into a vector; and

means for computing said computed network performance metric between said first network element and said second network element of said remaining network element pair by multiplying said vector by a row of said second matrix corresponding to said remaining network element pair.

59. (Original) The computer system of claim 53, wherein said means for computing said computed network performance metric between said first network element and said second network element of said remaining network element pair further comprises:

means for creating a vector equivalent to said non-independent row of said first matrix by combining a plurality of said independent rows of said first matrix; and

means for computing said computed network performance metric by combining a measured network performance metric of each network element pair of said second set of network element pairs corresponding to one of said plurality of said independent rows of said first matrix.

APPENDIX OF EVIDENCE

No evidence has been relied upon in this appeal that was submitted pursuant to 37 C.F.R. §§ 1.130, 1.131, or .132, or that was entered by the Examiner.

APPENDIX OF RELATED PROCEEDINGS

There are no appeals or interferences related to this application.